DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/19/2010 has been entered.

Response to Amendment

2. This Office action addresses pending claims 1-2 and 5-10. Claims 1-2 and 8 were amended, claims 3-4 were cancelled, and claims 9-10 were added in the amendment mailed 3/19/2010.

Claim Rejections - 35 USC § 103

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1-2 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Christian (WO 03/076339) in view of Noya et al. (US Patent 6,566,009).

Regarding **claims 1 and 2**, Christian discloses an alkaline battery **(10)** comprising:

- a positive electrode **(12)**, a negative electrode **(14)** and an alkaline electrolyte **(P8/L4-5 L9, see Figure 1),**
- said positive electrode **(12)** comprising a positive electrode material mixture containing nickel oxyhydroxide **(P1/L26-30)** and a graphite conductive material **(P10/L6-7 & P10/L22-31)**,
- wherein said nickel oxyhydroxide comprises a crystal having a beta type structure **(P6/L6-8)**, said crystal having manganese dissolved therein **(P3/L6-9)**, and
- the amount of said manganese contained in said nickel oxyhydroxide is 0.5 to 10 mol% relative to the total amount of nickel and said manganese contained in said nickel oxyhydroxide **(P3/L8-9)**.

To clarify, Christian discloses that a nickel oxyhydroxide can be prepared by combining a nickel hydroxide and a hydroxide salt in an inert atmosphere to form a mixture **(P4/L4-5)**. Christian further discloses that nickel hydroxide can include at least one bulk dopant including aluminum, manganese, cobalt, zinc, gallium, indium, or bismuth. It is noted that when a material, in this case nickel oxyhydroxide, is made by combining another material, in this case nickel hydroxide, which is doped with a substance, in this case manganese, the resulting material will contain the doped substance.

While Christian discloses an alkaline battery **(10)** comprising a beta type nickel oxyhydroxide, the reference does not explicitly disclose a battery also comprising electrolytic manganese dioxide. The reference does however discloses that generally

alkaline batteries have a cathode, an anode, a separator and an alkaline electrolyte solution and that the cathode can include a cathode material including manganese dioxide or nickel oxyhydroxide (P1/L5-8).

Noya discloses an alkaline battery **(C1/L41-50, see Figure 1)**, comprising a positive electrode containing <u>manganese dioxide **and**</u> nickel oxyhydroxide as an active material **(C1/L41-50)**. Noya further discloses that when a positive electrode contains 20 to 90% by weight of manganese dioxide and 80 to 10% weight of nickel oxyhydroxide, the alkaline battery has excellent discharge characteristics at the initial stage and after storage at high temperatures **(C2/L56-60)**.

Noya further teaches comparisons using various amounts of manganese dioxide and NiOOH **(see Table 6 through Table 10)**, wherein Table 9 contains a yttrium oxide **(C8/L45-67)**. For example, Noya teaches a battery **(battery number 26 in Table 9)** comprising manganese dioxide, NiOOH, and graphite in the weight ratio of 50:50:5 *(NiOOH is 50 wt% and manganese dioxide is 50 wt% relative to the total amount of NiOOH and manganese dioxide contained in positive electrode active material mixture, well within the)*. Moreover, in Table 9, the addition of manganese dioxide to an electrode of NiOOH appears to improve the initial storage and after storage of high temperature of the battery **(see battery numbers 26-29)**.

Christian and Noya are combinable because they are both concerned with the same field of endeavor, the making of an alkaline battery comprising nickel oxyhydroxide.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine the manganese dioxide in the electrode of the alkaline battery, as taught by Noya, with the nickel oxyhydroxide in the electrode of the alkaline battery as taught by Christian, for the purpose of having a battery with excellent discharge characteristics at the initial stage and after storage at a high temperature.

Even further, it would have been obvious to use the manganese dioxide and nickel oxyhydroxide in the weight ratio of 50:50 *(meeting the claim limitation of 30-60 wt% NiOOH and 40-70 wt% manganese dioxide)*, as taught by Noya **(battery number 26 in Table 9)**, because the discharge characteristics at the initial stage and/or after storage at a higher temperature were greater than of embodiments of weight ratios of 95:5 and 5:95 manganese dioxide to nickel oxyhydroxide **(battery numbers 23 and 29)** *(of which ratios are both outside of the claimed range)*.

Christian further discloses the battery **(10)** comprising an alkaline electrolyte **(P1/L5-6)** wherein the electrolyte can be an aqueous solution of alkali hydroxide, such as <u>potassium hydroxide</u>, sodium hydroxide, lithium hydroxide, or mixtures thereof **(C8/L22-23)**. The electrolyte, as further disclosed, can contain between 15 wt% and 60 wt%, between 20 wt% and 55 wt%, or between 30 wt% and 50 wt% alkali hydroxide dissolved in water **(P8/L23-25)**. In an example, beta nickel hydroxide and natural graphite and an aqueous electrolyte solution containing 38 wt% KOH and 2 wt% ZnO with a mortar and pestle (P15/L24-27). Although Christian discloses in a particular example a 38 wt% KOH aqueous solution (as opposed to the 40 wt% required by the claim) the claimed amount would have been obvious to one of ordinary skill in the art

through routine experimentations in an effort to optimize discharge characteristics and electrolytic activity taking into consideration the relative amounts of the active materials, manganese dioxide and beta nickel oxyhydroxide, the amount of conductive material, and the size of the battery.

Regarding the claim limitations recited in **claim 2**, which are directed to specific properties of the electrode comprising nickel oxyhydroxide and conductive graphite ("a constant current per gram of said nickel oxyhydroxide of 5 mA is applied to said molded article, the potential of said molded article has a first plateau region ranging from +500 to +100 mV relative to an Hg/HgO electrode and a second plateau region ranging from +100 to -400 mV relative to said Hg/HgO electrode; the discharge capacity per gram of said nickel oxyhydroxide in said first plateau region is 220 to 250 mAh, and; the discharge capacity per gram of said nickel oxyhydroxide in said second plateau region is 10 to 25 mAh"), it is noted that once nickel oxyhydroxide and conductive graphite are mixed with an aqueous electrolyte solution containing 38 wt% KOH (see Christian, P15/L24-27), and therefore is substantially the same as the mixture of nickel oxyhydroxide, conductive graphite, and 40 wt% KOH, it will, inherently, display recited properties absent any evidence to the contrary. See MPEP 2112.

Regarding **claims 5 and 6**, modified Christian discloses all of the claim limitations as set forth above. Christian discloses the battery wherein the electrode can include, for example, between 2 wt% and 35 wt%, between 3 wt% and 10 wt%, or between 4 wt% and 8 wt% of conductive carbon particles or a blend of conductive carbon particles **(P10/C28-31)**. Noya discloses the battery wherein the manganese

dioxide, nickel oxyhydroxide, and graphite were mixed at the weight ratio of 50 to 50 to 5 **(C3/L33-35)**.

Regarding **claims 7 and 8**, modified Christian discloses all of the claim limitations as set forth above. Noya discloses the battery wherein said positive electrode material mixture further contains at least one rare earth metal oxide selected from the group consisting of **Y_2O_3**, Er_2O_3, Tm_2O_3, Yb_2O_3, and Lu_2O_3 **(C1/L41-50)**, and the amount of said rare earth metal oxide is 0.1 to 2 wt% relative to the total amount of said nickel oxyhydroxide, said electrolytic manganese dioxide, said graphite conductive material and said rare earth metal oxide **(C2/L48-55 & C6/L11-25, see Table 4)**.

To clarify, Noya discloses the battery comprising at least one compound selected from the group consisting of an oxygen-containing zinc compound, an oxygen-containing, calcium compound, an oxygen-containing yttrium compound, and an oxygen-containing titanium compound **(C1/L41-50)**. An oxygen-containing compound from this group added to the positive electrode mixture raises the oxygen overpotential for the oxygen-generating reaction **(C2/L26-33)**. Noya continues to disclose the oxygen-containing compound contained in the positive electrode is 0.1 to 10% by mole of nickel oxyhydroxide, and especially when the content of oxygen-containing compound is 0.1 to 5% by mole of the nickel oxyhydroxide, discharge characteristics at the initial stage is improved **(C2/L48-55)**. Noya further discloses data results using the alkaline battery with amounts of yttrium oxide within these ranges such as 0.1, 1.0, and 5.0 mole% of yttrium oxide **(C6/L11-25, see Table 4)**.

5. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Christian (WO 03/076339) in view of Noya et al. (US Patent 6,566,009), as applied to claims 1 and 2 above, and further in view of Yano et al. (US 6,235,428).

Regarding **claims 9-10**, modified Christian discloses all of the claim limitations as set forth above, but the references do not explicitly disclose the positive electrode material further containing at least one rare earth metal oxide selected from the group consisting of Er_2O_3, Tm_2O_3, Yb_2O_3, and Lu_2O_3, and the amount of said rare earth metal oxide is 0.1 to 2 wt% relative to the total amount of said nickel oxyhydroxide, said electrolytic manganese dioxide, said graphite conductive material and said rare earth metal oxide.

Yano teaches an alkaline storage battery **(abstract)** comprising a positive electrode **(5)** wherein the electrode can comprise nickel oxyhydroxide including a solid-solution element including manganese **(C6/L14-18)** and can also comprise an additive wherein the additive can be at least one rare earth element compound in a ratio of the 0.05 to 5 wt% to the nickel oxyhydroxide **(C4/L4-7)**. Yano continues to disclose the rare earth element compound as being an oxide of yttrium (Y_2O_3), erbium (Er_2O_3), thulium (Tm_2O_3), ytterbium (Yb_2O_3), and lutetium (Lu_2O_3) **(C4/L22-34)** and that their purpose is to increase the oxygen overvoltage of the positive electrode. Therefore, since the rare earth metal oxides comprising erbium, thulium, ytterbium, and lutetium are equivalent additives to the rare earth metal oxide as proposed by Noya (yttrium), it would have been obvious to one of ordinary skill in the art at the time of invention was made to replace the rare earth metal (including yttrium oxide) of Noya in modified Christian with

the erbium, thulium, ytterbium, or lutetium oxide of Yano, since substitution of known equivalent structures is generally recognized as being within the level of ordinary skill in the art.

Response to Arguments

6. Applicant's arguments with respect to claims 9-10 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argue that since Christian discloses that generally the cathode can include for example, between 60 wt% and 97 wt%, between 80 wt% and 95 wt%, or between 85 wt% and 90 wt% active cathode material, thereby disclosing that the minimum NiOOH can be 60 wt% and that the remaining 40 wt% contains a mixture of conductive carbon materials in addition to active cathode material, the amount of electrolytic manganese dioxide relative to the NiOOH is less than 40 wt% (because the lower limit of NiOOH disclosed by Christian is 60 wt%). Thereby suggesting that Christian teaches away from the claimed weight percents of the active materials.

This is not considered persuasive. Christian teaches that generally the cathode can include between 60 wt% and 97 wt%, between 80 wt% and 95 wt%, or between 85 wt% and 90 wt% of active cathode material **(P10/L8-11)**. However, Christian does not disclose that all batteries comprise 60 wt% or more of active cathode material, nor does Christian criticize, discredit or otherwise discourage batteries comprising less than 60 wt% active cathode material. Christian only discloses that generally batteries comprise more than 60 wt% active cathode material, and therefore Christian does not constitute

as a teaching away reference. Further, Christian teaches that the weight percent is an active cathode material, and does not expressly limit the material to NiOOH. Therefore, the active cathode material can include any known active materials in the electrode. As Noya teaches that the manganese dioxide and NiOOH are both used as the active material **(C1/L41-44)**, manganese dioxide would be included in the weight percent taught by Christian.

Moreover, Noya teaches that the mixture of manganese dioxide and NiOOH result in increased discharge characteristics during initial stage and after storage than electrode mixtures comprising pure or substantially pure mixtures of manganese dioxide or NiOOH (see battery numbers 1, 8, 23, and 29 of Noya). As Noya explicitly teaches an embodiment with weight percents of 50:50:5 of manganese dioxide, NiOOH, and graphite with increased discharge characteristics at the initial stage and/or after storage than mixtures of 95:5:5 and 5:95:5, it would have been obvious to combine the manganese dioxide with the NiOOH at 50:50:5, within the range recited in the claim, to provide a battery with increased discharge characteristics at the initial stage and/or after storage.

Applicants further argue that a person having ordinary skill in the art would not have found it obvious to modify Christian in view of Noya in such a manner as to achieve the configuration recited in claim 1 and 2 because such a composition achieves unexpectedly improved results.

This is not considered persuasive. Noya teaches that the combination of manganese dioxide and NiOOH result in increased discharge characteristics during the initial stage and after storage than electrode mixtures comprising pure or substantially pure mixtures of manganese dioxide or NiOOH (see battery numbers 1, 8, 23, and 29 of Noya). As Noya explicitly teaches an embodiment with weight percents of 50:50:5 of manganese dioxide, NiOOH, and graphite with increased discharge characteristics at the initial stage and/or after storage than mixtures of 95:5:5 and 5:95:5, it would have been obvious to combine the manganese dioxide with the NiOOH at 50:50:5, within the range recited in the claim, to provide a battery with increased discharge characteristics at the initial stage and/or after storage at high temperatures. Therefore, one of ordinary skill in the art would be motivated to modify Christian in view of Noya as such a combination provides a battery with increased discharge characteristics at the initial stage and/or after storage at a high temperature.

Furthermore, allegations of unexpected results must be supported by data, however the disclose provided in the instant specification falls far short of providing the necessary data to evaluate unexpected results, and therefore the argument for unexpected results is not considered persuasive. Table 3 of the instant specification provides for a battery comprising an electrode comprising NiOOH with a specified amount of manganese, zinc, and cobalt in the NiOOH structure wherein the table provides data of the discharge capacity (in relative terms) and discharge time (in relative terms). The features of the batteries provided in Table 3 make no mention of the amount, if any, of manganese dioxide contained in the electrode comprising NiOOH, let

alone within the claimed range of 30-60 wt% of NiOOH and 40-70 wt% of manganese dioxide as recited in amended claim 1.

Additionally, the examiner also finds the showing of Table 3 not commensurate in scope with at least claim 1. Claim 1 not only requires that NiOOH and manganese dioxide within the claimed range (30-60 wt% NiOOH, 40-70 wt% manganese dioxide), of which examples have not been provided, but it also requires that the amount of manganese compound in the beta-NiOOH to be 0.5 to 10 mol%. However, Tables 1-3 only show beta-NiOOH with amount of 0, 3, 5, 6, and 9 mol% and does not show results at the upper and lower claimed range or results outside the claimed range.

It also appears that only a single test was run for each example leading the examiner to question the accuracy and reliability of the tests. Are the results reproducible? The margin of error for the tests is not stated, and thus the differences observed are not quantifiable in any sort of meaningful way as to the degree of observed improvement in discharge capacity or discharge time.

The examiner is also not persuaded that this is a comparison of the closest prior art. The examples provided in Tables 1-3 are only compared to batteries comprising compounds other than manganese in the crystal structure of beta-NiOOH. The examples also do not provide results for a battery comprising manganese outside of the claimed range. Moreover, none of the examples appear to comprise manganese dioxide inside or outside the ranged as recited in claim 1. Thus, a closer comparison would have been with batteries of various weight percents of manganese dioxide and

NiOOH and also of batteries comprising manganese in the crystal beta-NiOOH outside of the claimed mole percent range.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jacob Buchanan whose telephone number is (571)270-1186. The examiner can normally be reached on Monday - Friday 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on (571)272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. B./
Examiner, Art Unit 1795

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